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Kinetics and mechanistic investigation of epoxy-anhydride compositions cured with quaternary phosphonium salts as accelerators

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Abstract

© 2015 Wiley Periodicals, Inc.Mechanism and curing kinetics of bisphenol A epoxy resin-is--methyltetrahydrophthalic anhydride compositions using quaternary phosphonium salts as accelerators were investigated by differential scanning calorimetry (DSC) and electrospray mass-spectrometry (ESI-MS). The DSC method was applied to investigate curing kinetics and apparent activation energy values for the overall curing process. The DSC results showed that some of the phosphonium salts lead to a lower activation energy, that means they are more effective accelerators for the curing of epoxy-anhydride systems. The mechanism of curing was studied by ESI-MS using the model reaction of epichlorohydrin (E) with phthalic anhydride (PA) in the presence of phosphonium salts or 2-methylimidazole. Products containing the alkyl moiety of the phosphonium salt in form of alkyl esters could be identified. This suggests that the phosphonium salts activate the anhydride by electrophilic attack.

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Keywords

cure kinetics, curing mechanism, differential scanning calorimetry, epoxy-anhydride, quaternary phosphonium salts